Integral Experiments Analysis for Validation and Improvement of Minor Actinide Data for Transmutation Needs

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The fuel form to be used in advanced nuclear systems dedicated to transmutation will contain a high fraction of Pu and Minor Actinides (MA). High quality cross sections are crucial for these isotopes, to provide reliable neutronic design and fuel cycle assessment. Basic data are available for these isotopes but a detailed validation is needed to quantify their reliability. In the framework of the CEA/DOE international collaboration on the Advanced Fuel Cycle Initiative, a very comprehensive effort is underway to exploit the unique CEA experimental data base in order to validate and improve the current set of cross sections (JEF and ENDF libraries), branching ratios and decay constants. The cleanest and most useful irradiation experiments available in the CEA data base are the PROFIL and TRAPU programs, which cover the full range of Pu and Am isotopes and some Cm data. Previous papers have reported on the experiment analysis. The observed C/E's on the final densities of the measured isotopes for the different basic data files have indicated some large discrepancies that a subsequent sensitivity/uncertainty analysis has attributed to specific cross sections of actinides. Among them: ^{238}U (n,2n), capture cross sections of higher plutonium isotopes , ^{241}Am, ^{243}Am, and ^{242}Cm. capture cross sections. More recently, in order to provide trends and indications that cross section evaluators can exploit, a simulated adjustment, at one group level, has been carried out using the TRAPU experimental results. The one group cross sections before and after adjustment for JEF2.2 and ENDF/B-VI have shown consistency with values that tend to converge. In the full paper results relative to a more comprehensive analysis of irradiation experiments (TRAPU, PROFIL), critical masses (including new data from the Neptunium Sphere Experiment), and spectral indices measurements will be provided along detailed energy adjustment suggestions. The impact on design and fuel cycle parameters will be underlined.

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